

Mount Diablo Astronomical Society

Diablo Moon Watch

July 2011

GENERAL MEETING

Tuesday July 26, 2011

LIGO and The Search for Gravitational Waves

By Dr. Peter Beyersdorf

*Doors open at 6:45 p.m.
Concord Police Association Facility
5060 Avila Road, Concord*



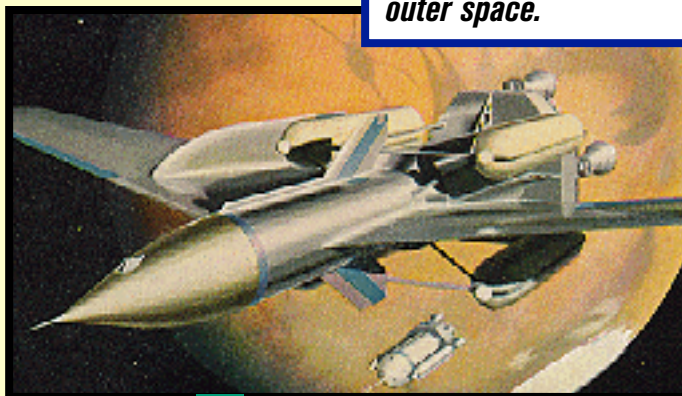
The Laser Interferometer Gravitational Wave Observatory (LIGO) has recently concluded its final science run.

Capable of detecting strain in space time as small as 10^{-24} , the observatory's mission is to search for gravitational waves predicted by Einstein's theory of General Relativity, and produced by some of the universe's most energetic events including black hole and neutron star collisions, supernovae, and the big bang itself. This talk will discuss the technical challenges involved in this first-of-a-kind experiment, and present the theory of operation of the detector. Preliminary science results will also be discussed.

Associate professor of Physics at San Jose State University, Peter Beyersdorf received his PhD from Stanford University in 2001 where his research focused on optimizing optical interferometers for gravitational wave detection. He continued this work on gravitational wave detection at the National Astronomical Observatory of Japan, as a scientist at the TAMA 300 gravitational wave observatory through 2004. His current research focuses on high precision measurements of the optics in gravitational wave detectors for sensing and control of thermal deformations to allow for improved sensitivity and increased uptime of current and future generations of gravitational wave detectors.

WHAT'S UP

Chesley Bonestell, a pioneering creator of astronomical art, was dubbed the "Father of Modern Space Art". He was a painter, designer and illustrator. He inspired an entire generation of astronomers, artists, writers and visionaries with his remarkable paintings. Living to the age of 98, he saw the entire scope of manned flight, and he influenced mankind's push into outer space.



PRESIDENT'S CORNER

Really old astronomy books!

by Chris Ford

One of my guilty pleasures is collecting old popular astronomy and related science books. By "old" I mean books that are over 50 years old, and whose ideas are often at considerable variance with what we know today. Astronomical research continues to advance so rapidly that even books written just 5-10 years ago are increasingly dated. Cosmology and planetary science books in particular become obsolescent so quickly that almost anything written before the year 2000 is out of date. Just 10-years ago the expansion of the Universe was not accelerating, the significance of dark energy was not appreciated, the discovery of extra-solar planets was only just beginning, and there were few high resolution images of the surface of Mars or the Saturnian system. In just one decade, our understanding of these astronomical subjects and many others has advanced in leaps and bounds.

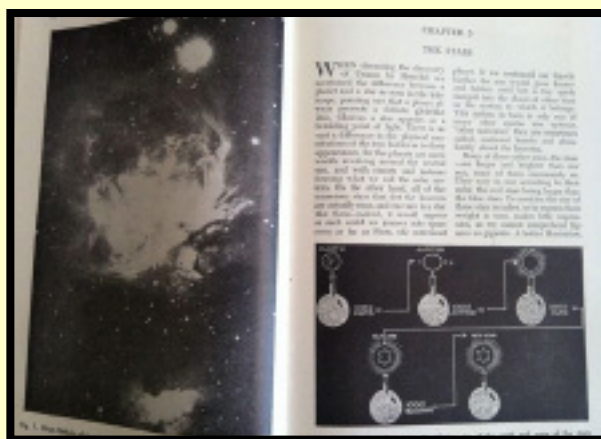
However, it is significantly older popular astronomical books that I find provide a particularly fascinating and revealing insight into the thinking of their times. It is both educational and often amusing to look at how far our knowledge has advanced over 50 years and more, how former certainties have since been demolished, and why we should never be complacent that our current

understanding represents the final word in astronomical research.

So for this month's President's Corner I have selected a few older astronomical and planetary science books to look at what they got right and more interestingly what they got wrong. All were well regarded at the time of their publication, and in highlighting ideas that have since proven to be in error, the intent is not to make fun of the authors, but to acknowledge that these ideas made perfect sense from the observational evidence available at the time. Of course as popular science writers, all of these authors would be the very first to admit being wrong and to delight in what we now know. Here are some of my favorites.

The first is a popular science book published in 1941 called the "The marvels and mysteries of science" with Clyde Fisher of the Heyden Planetarium attributed as author of the astronomical sections. This is a type of book that is rarely published these days, and it says something about the time that one popular science book attempted to (seriously) encapsulate the whole of science in just 800 pages. I still have my Fathers copy of this book, and as a child one illustration that captured me (and still does) is the explanation of the relationship of the colors of stars to their size by showing

them poured into bottles. What an image! I got it immediately even if it is simplistic in the extreme and hardly does justice to the realities of stellar evolution. (Note that the adjacent big observatory picture of M42 is easily surpassed by what amateur astrophotographers can achieve today)



The Marvels and mysteries of science: Stars in bottles:

This illustrates one of the most charming aspects of many books of this period, and that is the imaginative visual metaphors used to illustrate extreme quantities and distances. For example in the same book, the distance from the sun to our nearest neighboring star Proxima Centauri is described in terms of the weight of spiders web! Apparently if 1 pound of spiders web is enough to encircle the Earth's equator, then apparently 500,000 tons of spiders web is required to stretch to Proxima Centauri. (True or not that is one big spider) This book was written at a time when the largest telescope in the world was only 100", (just twice the size of

Really old astronomy books! (Continued from previous page)

the largest amateur instruments today) and Hubbles discovery of our Milky Way's relation to other galaxies (or "island universes" as they were then called) was only just beginning to register in the public consciousness. A number of theories and ideas in this book are completely wrong however. For example, the Moon was generally accepted to have been flung out of a rapidly rotating Earth though we now know this is dynamically impossible.



The origin of the Moon? Not quite!

The nebular hypothesis is accepted as the origin of our solar system so they got that right, and then illustrated it with a picture of M81 as another solar system in the making!

A solar system in the making? Uh.. no!

These misconceptions aside,



the book does a reasonable job in illustrating the state of astronomical knowledge at this time without being too far off the mark. The same could not be said for planetary science.

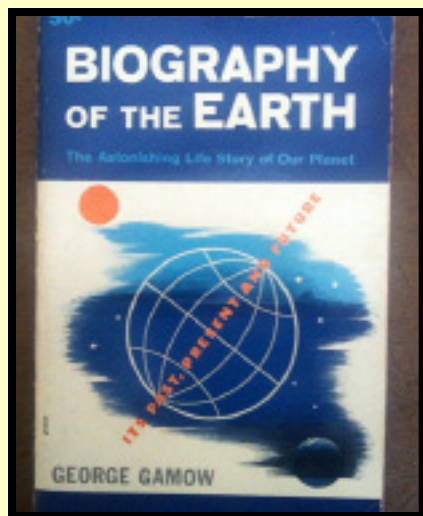
The "Biography of the Earth" also written in 1941 is a contemporary popular science book illustrating our understanding of Earth's place in the Universe. Author George Gamow (1904-1968) was a very renowned physicist acclaimed for his research into stellar evolution and he was also an excellent popular science writer. Even Gamow could only work within his contemporary intellectual framework however, which for geophysics was almost equivalent to astronomy's pre-Copernican period. The story of the Earth according to Gamow is not at all the planet we recognize

today. To start with, at 2 billion years old Gamow's Earth is half the currently accepted age of 4.6 billion years. As described in the "Marvels and mysteries of science", the Moon was spun out of the Earth and according to Gamow the hole left is now occupied by today's Pacific ocean (poetically described as "the scar of the rupture") with most of Earth's subsequent physical features directly resulting from this event. In 1941, ongoing continental drift was not quite respectable in the absence of any underlying theory to explain it

and plate tectonics lay over 20 years in the future. Gamow does acknowledge that the continents may have drifted away from the hole left by the Moon during the very earliest times but have subsequently been frozen in place for eons. One of the odder notions is that mountain ranges were created by the Earth shrinking 150 kilometers over its existence rather like a dried prune in which the wrinkles represent mountains. Extrapolating from this idea, Gamow calculated the amount of time it would take for erosion to completely wear down a mountain range and compared it to the rate of "wrinkling", estimating that there have only been 5 ages of mountain building over the past 2 billion years, and that for most of Earth's existence our planet was flat, smooth, and featureless, most of it covered by shallow seas.

Really old astronomy books! (Continued from previous page)

Despite its errors I have a particular affection for this book as Gamow is such a good writer that everything he describes makes perfect sense - as long as you forget 60 years of subsequent research.



The Biography of the Earth by George Gamow

The Conquest of Space published in 1950, is one of the most influential books on space exploration and astronomy ever written, and was directly responsible for inspiring a whole generation of astronomers and engineers who made the space age happen. Written by the well known science writer and space advocate Willy Ley, (1906-1969) this book does a good job in describing the mechanics of how we might explore the solar system based on what we knew in the 1950's and it feels very much a product of its era. What this book is most famous for though are the wonderful astronomical paintings by Chesley Bonestell (1888-1986) illustrating in color the best contemporary idea of what our neigh-

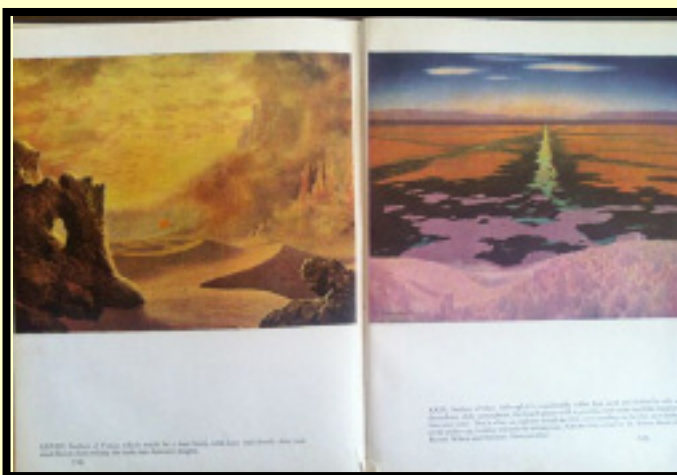
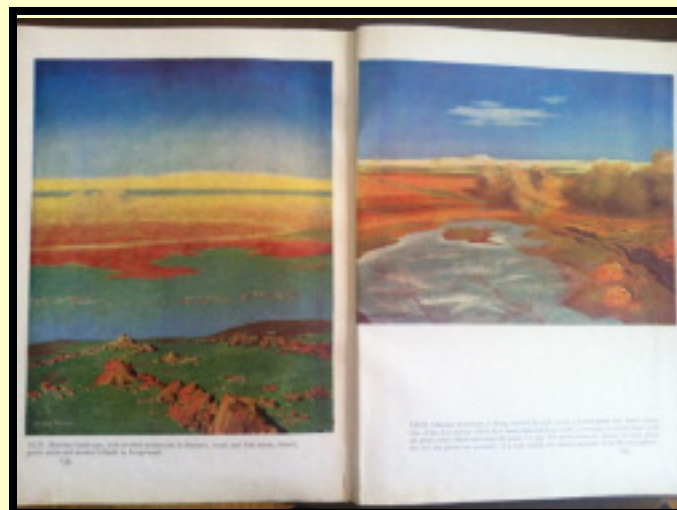
boring worlds looked like. This is a solar system in which Venus is a dusty wind blown desert, Mars is covered by green vegetation, the mountains of the Moon are fantastically jagged and eroded, the chilly outer moons of the solar system are made of rock not ice, Titan has a beautiful blue sky, Jupiter has a solid surface that you could walk on, and space-ships look like V2 rockets on steroids. I could go on but the images are gorgeous. Planetary surfaces as painted by Chesley Bonestell are not the ones we know today, but they should have been!

The Conquest of Space: The surfaces of Venus and Mars.

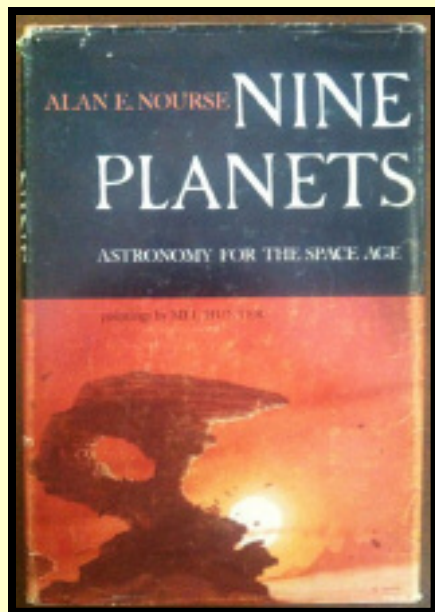
Finally, lets step forwards to 1960 and look at "Nine planets, astronomy for the space age." Author Alan Nourse (1928-1992) is best known as a science fiction writer, but he was also a medical doctor and a talented popular science author. By 1960, we are in the early space age and what really stands out for me in this book is how badly we wanted to believe that life was widespread across our solar system. In fact it is now hard to believe how widely accepted was the notion of Martian vegetation as was a balmy

ocean or jungle covered Venus, even as late as the early space age. Nourse goes further and discusses at length the prospects of life on the surface of Jupiter and even Mercury! This is amongst the very last popular science books written on the Solar System before we started receiving real data from the early Mariner and Soviet missions and is noteworthy on that account alone.

All of these



Really old astronomy books! *(Continued from previous page)*



books are still well worth looking

at if you ever come across a copy, even if only to temporarily put you into the mindset of the times. They are all a pleasure to read and should be appreciated on their own terms in that they reflect the observational evidence that was available at the time. I do not think any of us can say that we could have done better. Above all though, these books tell us why we should not be complacent today. Given our ever improving instrumentation and analytical tools with which to process an increasingly large body of observational evidence, I look forwards to my successor in the 2070 MDAS Presidents Corner mar-

veling at our understanding of astronomy in 2011 and what we got wrong!

Finally on a separate note, I would like to let all MDAS members know that I have joined the Board of Directors of the Astronomical Society of the Pacific. This should have no impact on my duties as President of the MDAS, but it is certainly an opportunity that I will use to advocate for the greater cause of amateur astronomy in the 21st century.

Chris Ford

NEW MDAS JACKETS NOW AVAILABLE! ORDER BY JULY 18th.

Be among the first to wear the new royal blue, embroidered and personalized MDAS jacket. We are placing the order on July 18th, so reserve yours online now:

http://www.mdas.net/mdas_store.html#MDAS_Jacket

The jackets are likely to be ready by our July 26th meeting. You may also reserve your personalized jacket by calling Marni Berendsen at 925-930-7431 or sending her an email (berendsen@aol.com) before July 18th with your size and how you want your name to appear (e.g. "Joe", "Jane", "E.T.") and then bring a

payment for \$55 to the July meeting to pick up your jacket.

Or mail a \$55 check right away made out to M.D.A.S. along your size and the name to:
Mount Diablo Astronomical Society
P.O. Box 4889
Walnut Creek, CA 94596

We only place jackets orders twice a year, so order yours now!



Meteors and Scientific Resistance

by Nathaniel Bates

Thomas Jefferson was definitely a sectional partisan.

He once stated that he preferred to "believe that (a) Yankee professor would lie than that stones would fall from heaven." In essence, Thomas Jefferson would prefer to disbelieve in meteors than to believe

the word of someone who might have been a Northern Federalist. This line of thought sounds strange from someone who was a partisan of the scientific

Enlightenment like Jefferson was. However, Jefferson was referring to

Professor Benjamin Silliman's investigation of the claim that a rock fell from the sky in Weston Connecticut on December 14, 1807. The idea that meteors fell from the sky was still not universally accepted by scientific thought at that time. Thomas Jefferson was simply upholding scientific orthodoxy.

The purported sky rock fell to the ground on December 14, 1807 in Weston Connecticut.

It was widely reported and soon news spread. Oddly, this was no mere shooting star. Witnesses reported three explosions. The fireball split in to six different places and could actually be collected for study. Fragments of the

purported space rock were collected by Yale Professors Benjamin Silliman and James Kingsley. The very fact that these men were Northern Yale Professors may well have sent a shiver up the spine of Southern sectionalists like Thomas Jefferson. Suspicion over issues of

Federal power and industrialism between Federalists and Jeffersonians may well have extended to suspicion over questions of science.

Suspensions that got in the way of objective science still lingered even in an Age of Enlightenment.



The rocks in question are now confirmed meteors.

By the late nineteenth century, meteors were understood to be rocks from outer space. The question remains, however, as to why educated opinion once opposed such an idea. One wonders why a brilliant scientists and philosopher like Thomas Jefferson would have doubted the idea of space rocks. A similar doubt was held by European scientists of the French Enlightenment. There are a number of factors that could be considered. One of them might be a holdover of the strong Platonic and Aristotelian leanings of many philosophers. Most Astronomers were first and foremost natural

philosophers who still wanted a perfect mathematical Universe. Just a few centuries before Jefferson, the Ptolemaic and Copernican views of the Solar System both held to perfectly circular orbits for planets. Such orbits were considered "perfect" because the circle was held as the perfect shape by the ancient Greek Platonists who influenced medieval and early modern thought. Kepler demonstrated that planets had elliptical orbits, dethroning this one vestige of the older mathematical Platonism. However, even Kepler himself viewed the Solar System as being comprised of perfect harmonies and ratios.

The idea of the Solar System as a rocky place was one that was not as aesthetically pleasing for certain natural philosophers as was the idea of the Solar System as a perfect mathematical harmony. One can see their point in many ways. The mathematical equations governing Newtonian and Keplerian laws are very beautiful. In addition, Titius-Bode harmonies are awesome to contemplate, even if they cannot be understood as iron-clad laws. The great hope of the Newtonian Age was to contemplate a Universe of such harmonies. Envisioning rocks hurled through the sky puts a degree of complexity in to our view of the Solar System. The acceptance of such a view would have to wait until science and mathematics could handle complexity in the mid-nineteenth century.

Meteors and Scientific Resistance *(Continued from previous page)*

However, there is another possible perspective on the question of why educated scientists resisted the idea of meteors until the mid-nineteenth century.

One has to remember that “rocks from the sky” held the same association in the eyes of the wealthy and educated that “bigfoot” has today. Such events as meteors were seen by peasants and rural folk. In France, the pre-revolutionary climate was hostile to meteor research precisely because rocks from the sky were associated with peasant belief structures. The French Revolutionary government broke the mould once it brought peasant concerns to power. And, it may well have been nineteenth century democratic aspirations that broke the mould elsewhere. Nineteenth century Europe was ready to accept the idea that the Solar System was a dynamic environment in which some degree of what could be termed “chaos” was compatible with mathematical order.

What convinced nineteenth century science of the factual nature was the precision with which Giovanni Schiaparelli was able to correlate the orbit of the Leonid Meteor Shower with the

path of Comet Tempel-Tuttle. Comet Tempel-Tuttle was the parent body of the Leonid Meteor shower. The idea of meteors as space rocks fit the data perfectly. Ever since then, the study of meteors became “legitimate” in the eyes of scientists. Naturally, chemistry confirmed that the same elements that exist on Earth



exist everywhere else. The fact that meteors contain the same elements that Earth rocks contain confirmed a view of the cosmos in which the Earth was no longer separated from the heavens as was the case in pre-Copernican systems. The history of modern science has been a history of overcoming the pre-Copernican idea that the Earth and the heavens are fundamentally different. At long last, the idea of space rocks shattered the Platonic Solar System.

This article is intended to be somewhat of a cautionary tale. Often, it is assumed that scientific fact corresponds to scientific opinion. Yet, more often than not,

scientific fact has had to overcome scientific opinion in order to be recognized. This was the case with the existence of meteors. As we enter an era in which we are seriously considering the possibility of life elsewhere, we might also face similar situations in which scientific opinion is biased against a given possibility because it does not conform to the dominant paradigm. One of those hidden biases may well be the pre-Copernican biases that prevented educated opinion from considering the idea of meteors in the eighteenth century. The pre-Copernican bias may well set the bias for evidence so high for any kind of extraterrestrial life that no evidence would ever be considered. This would do a disservice to Astrobiology. Let us hope that this possibility can be avoided so that the mystery of our place in the biological cosmos can unfold just as the mystery of space rock unfolded.

MDAS Docent Training July 19th

by Marni Berendsen

We just heard from Mount Diablo State Park, letting us know that a docent training has been scheduled for Tuesday, July 19th, 6 - 9 pm. For details, further instructions, and directions click on the link below.

If you would like to participate in the fun and excitement of setting up your telescope or binoculars at our public astronomy events on the mountain, the Park requires that you go through this training.

***Upcoming Mount Diablo Astronomical Society Event:
Tuesday 7 July 19, 2011 6:00 P.M. to 9:00 P.M.***

Mount Diablo State Park Docent Training, Mitchell Canyon Visitor Center, Clayton, CA

More details:

http://nightsky.jpl.nasa.gov/event-view.cfm?Event_ID=29044

If you are planning to attend, please contact:

Carl Nielson
CNIELSON@parks.ca.gov
State Park Peace Officer
Mount Diablo State Park
(925) 837-6129

If have have already been through docent training any time in the past, you do not need to take it again.

A big thank-you to all the members who entertained our visitors last night on the mountain! And thanks to Sports Basement for providing the free refreshments.

Your Help Would Be Greatly Appreciated

Our association need a few members to come at 6:30 p.m. before our monthly meeting which starts at 7:15 p.m. to help in seting up the chairs and other elements needed to conduct the general meeting.

Similarly at the end of each meeting the chairs and tables have to be removed, the room has to be cleaned and the garbages emptied.

Thank you for your help.



Mount Diablo Astronomical Society Event Calendar—July 2011

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
26	27	28	29	30	Golden State Star Party 1 	2 Events 2 Sunset: 8:36 PM
Golden State Star Party 3	Independence 4	5	6	8:00 PM Pinecrest Stargazing 7	8 	8:00 PM Astronomy: TELESCOPES 9 Sunset: 8:34 PM
10	Board Meeting (Private) 11	12	13	8:00 PM Pinecrest Stargazing 14	15 	8:30 PM Round 16 Hill Campout Sunset: 8:31 PM
17	18	8:00 PM Docent Training Session 19	20	8:00 PM Pinecrest Stargazing 21	22	23 Sunset: 8:27 PM 
24	25	7:15 PM GenMig: LIGO & Grav Waves 26	27	NSN Telecon (Private) 28 8:00 PM Pinecrest Stargazing	29	Society Observing (Private) 30 Sunset: 8:21 PM 
31	1	2	3	4	5	6

Board Members & Address

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Chris Ford - cford81@comcast.net

Vice President

Rick Linden - Rick.C.Linden@gmail.com

Membership Coordinator, Mtg Room

Marni Berendsen - berendsen@aol.com

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New Member Steward

Nick Tsakoyias - claytonjandl@aol.com

Mailing address:

MDAS

P.O. Box 4889

Walnut Creek, CA 94596-

General Meetings:

Fourth Tuesday every month,

except on the third Tuesday

Refreshments and conversations

Meetings begin at 7:15pm.

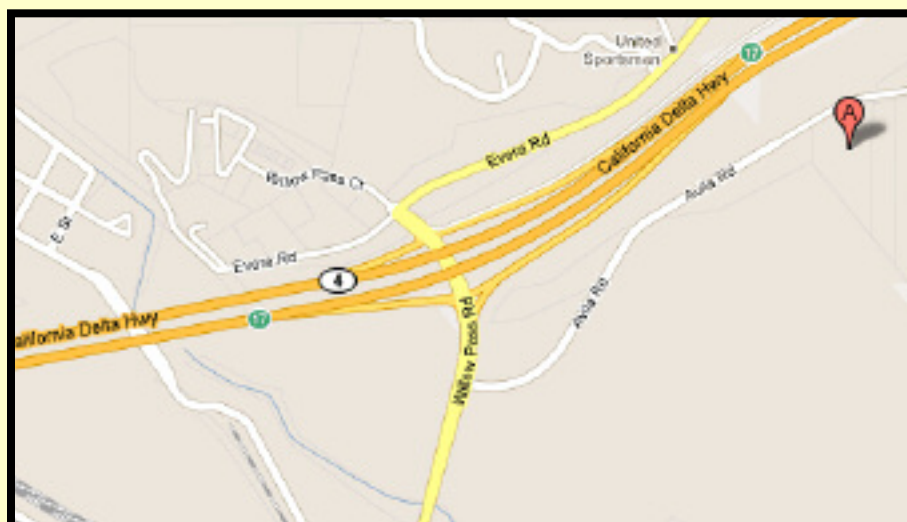
Where:

Concord Police Association

5060 Avila Road, top of the

Take Avila Road from Willow

Directions to facility:



Telescopes Needed

by Jim Head

Upcoming Mount Diablo Astronomical Society Event:

Saturday July 16, 2011 from 8:30 P.M. to 10:00 P.M.

Round Hill Campout, Round Hill Country Club, Alamo, CA Setup 7:30 P.M.

More details: http://nightsky.jpl.nasa.gov/event-view.cfm?Event_ID=27852